

# PATENT COOPERATION TREATY

## PCT

### INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY


(Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

REC'D 26 SEP 2005

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Applicant's or agent's file reference		<b>FOR FURTHER ACTION</b>		See Form PCT/PEA/416
International application No. PCT/GB2004/002023		International filing date (day/month/year) 12.05.2004	Priority date (day/month/year) 23.06.2003	
International Patent Classification (IPC) or national classification and IPC C07C213/10, C07C215/12, C07C215/08				
Applicant BP CHEMICALS LIMITED				
<p>1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.</p> <p>2. This REPORT consists of a total of 4 sheets, including this cover sheet.</p> <p>3. This report is also accompanied by ANNEXES, comprising:</p> <p>a. <input checked="" type="checkbox"/> sent to the applicant and to the International Bureau a total of 2 sheets, as follows:</p> <p style="margin-left: 40px;"><input checked="" type="checkbox"/> sheets of the description, claims and/or drawings which have been amended and are the basis of this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).</p> <p style="margin-left: 40px;"><input type="checkbox"/> sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.</p> <p>b. <input type="checkbox"/> (sent to the International Bureau only) a total of (Indicate type and number of electronic carrier(s)) , containing a sequence listing and/or tables related thereto, in computer readable form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).</p>				
<p>4. This report contains indications relating to the following items:</p> <p><input checked="" type="checkbox"/> Box No. I Basis of the opinion</p> <p><input type="checkbox"/> Box No. II Priority</p> <p><input type="checkbox"/> Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability</p> <p><input type="checkbox"/> Box No. IV Lack of unity of invention</p> <p><input checked="" type="checkbox"/> Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement</p> <p><input type="checkbox"/> Box No. VI Certain documents cited</p> <p><input type="checkbox"/> Box No. VII Certain defects in the international application</p> <p><input type="checkbox"/> Box No. VIII Certain observations on the international application</p>				
Date of submission of the demand  19.01.2005		Date of completion of this report  27.09.2005		
Name and mailing address of the international preliminary examining authority:   European Patent Office - P.B. 5818 Patentlaan 2 NL-2280 HV Rijswijk - Pays Bas Tel. +31 70 340 - 2040 Tx: 31 651 epo nl Fax: +31 70 340 - 3016		Authorized Officer  Fitz, W  Telephone No. +31 70 340-4359		



**INTERNATIONAL PRELIMINARY REPORT  
ON PATENTABILITY**

International application No.  
PCT/GB2004/002023

**Box No. I Basis of the report**

1. With regard to the **language**, this report is based on the international application in the language in which it was filed, unless otherwise indicated under this item.
  - ☐ This report is based on translations from the original language into the following language , which is the language of a translation furnished for the purposes of:
    - ☐ international search (under Rules 12.3 and 23.1(b))
    - ☐ publication of the international application (under Rule 12.4)
    - ☐ international preliminary examination (under Rules 55.2 and/or 55.3)
2. With regard to the **elements\*** of the international application, this report is based on *(replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report)*:

**Description, Pages**

1-11 as originally filed

**Claims, Numbers**

1-10 filed with the demand

- ☐ a sequence listing and/or any related table(s) - see Supplemental Box Relating to Sequence Listing
3. ☐ The amendments have resulted in the cancellation of:
    - ☐ the description, pages
    - ☐ the claims, Nos.
    - ☐ the drawings, sheets/figs
    - ☐ the sequence listing (*specify*):
    - ☐ any table(s) related to sequence listing (*specify*):
  4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).
    - ☐ the description, pages
    - ☐ the claims, Nos.
    - ☐ the drawings, sheets/figs
    - ☐ the sequence listing (*specify*):
    - ☐ any table(s) related to sequence listing (*specify*):

\* If item 4 applies, some or all of these sheets may be marked "superseded."

**INTERNATIONAL PRELIMINARY REPORT  
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International application No.  
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**Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

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1. Statement

Novelty (N)	Yes: Claims	1-10
	No: Claims	-
Inventive step (IS)	Yes: Claims	1-10
	No: Claims	-
Industrial applicability (IA)	Yes: Claims	1-10
	No: Claims	-

2. Citations and explanations (Rule 70.7):

**see separate sheet**

**Item V**

D1: US-B-6 291 7151

The document D1 is regarded as being the closest prior art to the subject-matter of claims 1 and 10. D1 discloses a process for the preparation of ethanolamines having improved colour quality. The process comprises a hydrogenation of the ethanolamine in the presence of a heterogenous metal catalyst comprising one or more metals chosen from rhenium, ruthenium, rhodium, palladium, osmium, iridium, platinum and silver, and a support material such as activated carbon. Thus the process of D1 is a hydrogenation treatment.

The subject-matter of claims 1 and 10 mainly differs from this known process in that the atmosphere is free of hydrogen. It is not a hydrogenation treatment.

Accordingly, the subject-matter of claims 1-10 is new (Article 33(2) PCT).

The problem underlying the present invention may be regarded as the provision of a further process for preparing an ethanolamine having an improved colour quality.

D1, alone or in combination with another document of the prior art, would not suggest the preparation of an ethanolamine with an improved colour quality by the activated carbon/free of hydrogen atmosphere process proposed in present claims 1 and 10.

Accordingly, the subject-matter of claims 1-10 is considered as involving an inventive step (Article 33(3) PCT).

BPCL 10 048 / B 442 (1)

CLAIMS

1. Process for preparing an ethanolamine having an improved colour quality, characterised in that it comprises a contacting of an ethanolamine with an activated carbon free of one or more metals chosen from rhenium, ruthenium, rhodium, palladium, osmium, iridium, platinum and silver, under an atmosphere free of hydrogen.
2. Process according to claim 1, characterised in that the ethanolamine is an ethanolamine or a mixture of two or more ethanolamines chosen from monoethanolamine (MEA), diethanolamine (DEA) and preferably triethanolamine (TEA).
3. Process according to claim 1 or 2, characterised in that the ethanolamine is prepared in a synthesis stage by reacting ethylene oxide with ammonia, preferably in aqueous medium.
4. Process according to any one of claims 1 to 3, characterised in that the ethanolamine has initially, prior to its contacting with the activated carbon, a colour index (according to ASTM standard D 1209) of more than 40 Pt/Co, preferably more than 50 Pt/Co, and optionally a content by weight of metal, preferably of iron, equal to or more than 6 parts per million (ppm), more particularly equal to or more than 8 ppm, in particular equal to or more than 10 ppm.
5. Process according to any one of claims 1 to 4, characterised in that the activated carbon has a specific surface area ( $N_2$  BET) of from 500 to 5000  $m^2/g$ , preferably from 500 to 2500  $m^2/g$ , more particularly from 700 to 2000  $m^2/g$ .
6. Process according to any one of claims 1 to 5, characterised in that the contacting of the ethanolamine with the activated carbon is carried out at a temperature of from 10 to 200°C, preferably from 15 to 100 °C, more particularly from 20 to 80 °C.

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7. Process according to any one of claims 1 to 6, characterised in that the contacting of the ethanolamine with the activated carbon is carried out for a period sufficient to reduce the colour of the ethanolamine, preferably for a period such that the colour index (according to ASTM standard D 1209) of the ethanolamine becomes equal to or less than 50 Pt/Co, preferably equal to or less than 40 Pt/Co, more particularly equal to or less than 30 Pt/Co.
8. Process according to any one of claims 1 to 7, characterised in that the mean residence time of the ethanolamine contacted with the activated carbon is chosen in a range of from 10 minutes to 18 hours, preferably from 30 minutes to 12 hours, more particularly from 1 to 8 hours.
9. Process according to any one of claims 1 to 8, characterised in that it is carried out during or after the stage of preparation of the ethanolamine, preferably during or after the stage of purification of the ethylene.
10. Process for manufacturing a triethanolamine (TEA) having an improved colour quality, which process comprises the following stages:
- (i) a stage for synthesising TEA by the contacting of ethylene oxide with ammonia in aqueous medium, so as to form a crude TEA containing monoethanolamine (MEA), diethanolamine (DEA) and TEA, as a mixture with water and ammonia in excess and/or not having reacted,
  - (ii) a stage for separating the crude TEA and the mixture of water and ammonia, so as to isolate and recover the crude TEA, and
  - (iii) a stage for purifying the TEA by distillation of the crude TEA, so as to separate substantially the MEA and the DEA from the TEA, and to isolate and recover a purified TEA containing at least 85 wt % of TEA,
- which process is characterised in that, after the separation stage (ii) or during or after the purification stage (iii), the crude or purified TEA is contacted with an activated carbon free of one or more metals chosen from rhenium, ruthenium, rhodium, palladium, osmium, iridium, platinum and silver, under an atmosphere free of hydrogen.

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